IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#26

Re: Docket 5211.004

In re application of: ALLEN, Mark R.

Group Art Unit: 2821

Serial No. 09/339,616

Examiner: Vo

Filed: June 24, 1999

Title: Improved Embodiment to LED Light String

NEW APPEAL BRIEF UNDER 37 C.F.R. 1.192

Assistant Commissioner for
Patents and Trademarks
Washington, D.C. 20231

Sir:

In response to the Notification of Non-Compliance with 37 C.F.R. 1.192(c), this new brief is submitted in triplicate with the appropriate fee in accordance with 37 CFR 1.192.

(1) **Real Party In Interest:** Fiber Optic Designs, Inc., 704 Floral Vale Blvd., Yardley, PA, 19067, by virtue of assignment dated June 21, 1999, recorded June 24, 1999, Reel 010069, Frame 0597.

(2) **Related Appeals and Interferences:** None.

(3) **Status of Claims:** 1-9 and 11-28 pending, finally rejected and appealed. . In an Amendment dated January 4, 1999, claim 10 was cancelled.

(4) **Status of Amendments:** Applicant filed, concurrently with this Appeal Brief, an Amendment after Final Rejection requesting cancellation of claims 2, 3, 11, 12, 17 and 18. The same Amendment also requested acknowledgement from the Patent Examiner that the Declaration of Mark Allen and David Allen were received and considered by the Patent Examiner prior to issuance of the Final Rejection. The Examiner never acknowledged receipt of these Declarations.

(5) Summary of Invention:

The invention recited in claim 1 is directed to a light string comprised of LEDs (shown schematically in Figures 1 and 2). The light string is adapted to be connected directly to household type VAC (alternating current voltage source) via household plug **101** notwithstanding the fact that the light string is comprised of LEDs **102** that are intended to and ordinarily do operate on DC (direct current). The LEDs **102** are connected in series blocks (see Figs. 1 and 2) wherein the number of LEDs in each series block is determined according to the formula of dividing the nominal VAC voltage, i.e., 110 or 220 VAC, by the average AC drive voltage (not the DC drive voltage) of the LEDs used. Owing to this configuration, the unexpected result is that the LED light string requires neither an AC/DC converter, current reduction transformer, or any form of resistor circuitry connected between the light string and the household VAC to operate successfully on a long term continuous basis. The prior art expressly requires some type of additional resistor circuitry for stability. In addition, by virtue of the AC driving the LEDs at a sufficiently rapid frequency, i.e., 50 or 60Hz., the light is perceived as

continuous and uninterrupted to the human observer. Various and additional features of the invention are claimed in combination with the foregoing in the claims depending from claim 1, including a polarized socket feature (see Fig. 6), multi-colored LED feature, and a fiber-optic embodiment (see Fig. 8).

(6) Issues:

Generally, the issues presented on appeal are whether the cited references of Yamuro, Reymond, Frohardt, and Chang either alone (as in the case of Yamuro) or in combination render the claims obvious under 35 USC 103(a). Specifically, the dominant issue for decision on Appeal is whether the principle reference Yamuro requires or suggests the use of a resistor in the Yamuro described LED string light circuit in order to be stable. If a resistor is required in order for the Yamuro circuit to be viable, then the Yamuro reference fails as a basis for rejecting the claims of the subject application.

To rebut this principle rejection (all remaining rejections being predicated on this first and basic reliance on Yamuro by the Examiner), Applicant has submitted documentary evidence, i.e., a 37 CFR 1.132 Affidavit submission, of experiments conducted to demonstrate the non-viability of the resistor-less Yamuro LED circuits (that the examiner asserts are suggested by this reference) and, in addition, affidavit evidence of commercial success, failure of others, copying by others, with respect to the claimed subject matter[1].

[1] The Patent Examiner never acknowledged receipt of consideration of the Declarations of Mark Allen and David Allen filed March 21, 2001. Applicant has concurrently filed an Amendment After Final under 37 C.F.R. 1.116 canceling claims 2, 3, 11, 12, 17 and 18 and requesting acknowledgment of receipt of the Declarations of Mark Allen and David Allen.

(7) **Grouping of Claims:**

The claims are grouped according to the following rejections set forth by the examiner in the Final Office Action dated June 29, 2001:

Claims 1-3, 9, 14-16, and 25, rejected in view of Yamuro (USP 5,941,626) under 35 USC 103(a). **Claims 1-3, 9, 14-16 and 25 stand or fall together.**

Claims 4, 6-8, and 21-24 rejected over Yamuro in view of Reymond (USP 5,936,599) under 35 USC 103(a). **Claims 4, 6-8 and 21-24 stand or fall together.**

Claims 11, 12, 17, and 18 in view of Yamuro under 35 USC 103(a). **Claims 11, 12, 17 and 18 stand or fall together.**

Claim 5 over Yamuro in view of Reymond under 35 USC 103(a). **Claims 5 stands alone.**

Claims 13 and 28 over Yamuro in view of Frohardt (USP 3,758,771) under 35 USC 103(a). **Claims 13 and 28 stand or fall together.**

Claims 19, 20, 26, and 27 over Yamuro in view of Chang (USP 5,887,967) under 35 USC 103(a). **Claims 19, 20, 26 and 27 stand or fall together.**

(8) **Argument:**

1st Rejection

Summary: Claims 1-3, 9, 14-16, and 25 rejected under 35 USC 103(a) over Yamuro. Fig. 1B of Yamuro shows a series block of LEDs connected, via resistor (8), to a pair of source wires for AC power supply 9. The Examiner asserts this is a "direct" connection of the LED string to the power source inasmuch as the resistor 8 simply forms an

electrical conducting function. Alternatively, even if the resistor does not imply a "direct" connection, the resistor can be removed and then a "direct" connection would exist as it does in the present claims. (See Section 2 of Final Rejection for full statement of rejection.)

Rebuttal: The basis of the invention, i.e., the direct connection of an AC source to a block of series connected LEDs is set forth in the language of claim 1 in three separate phrases. In the first such phrasing (claim 1, bridging lines 4-5), the examiner reads the language of claim 1 to have no definition for the phrase "the first LED directly coupled intermediate a source end and a terminal end of a first pair of wires". While the wires leading from the source 9 in Yamuro have a "source end" and a "terminal end", the "source end" connects indirectly from the "source" 9 through a resistor 8 to the series block connected LEDs 4, 5, et seq. In contrast, the present claim recites the, "first LED directly coupled intermediate a source end and a terminal end".

This distinction is the fundamental basis of disagreement between Applicant's and the Examiner's assessment of the Yamuro disclosure. In the Examiner's view, the resistor equipped connection shown in Fig. 1B of Yamuro can be understood as a "direct coupling" as claimed. In Applicant's view, this is not a direct coupling as claimed inasmuch as the first LED in Yamuro connects through a resistor.

For the second phrasing of a "direct coupling" between the LED blocks and the AC source, Claim 1 also recites "the light string being free from additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires".

This claim 1 recited structure cannot reasonably be interpreted to include any circuitry, i.e., the resistor 8 as shown in Yamuro, between the first LED and the source of the AC. The claim language goes much further, however, and precludes circuitry from being including anywhere in the LED block and in-between the block and the VAC source.

Lastly, claim 1 also recites "a first connector...which connector facilitates a direct connection between the first LED and a first side of an alternating current electrical power supply". Again, the phrasing unambiguously precludes the Yamuro resistor from being a part of the circuit connecting the light string to the VAC source.

In anticipation, perhaps, that the first recitation of the Yamuro based rejection under 103 is not well founded in light of the claim language precluding the resistor, the Examiner recites an alternative rejection under 103, also relying on Yamuro, but in this version of the rejection eliminating the resistor in Yamuro and declaring the resistor "optional".

As an initial response, Yamuro considered as a whole does not teach or suggest elimination of the resistor. A plain reading of the language of Yamuro at col. 3, lines 34-41, sets forth the necessity of the resistor 8 in the Yamuro light string. To wit: "... the resistance 8 apparently seems unnecessary. However, it is proved from experience that the apparatus is stable in function by providing the resistance 8. Therefore, the resistance 8 is connected to the circuit as shown..." This is no small assertion in the language of Yamuro. Indeed, the notion that a resistor is necessary is the state-of-the-art in LED use and is bolstered by the experimental results conducted and documented in the Mark Allen, Declaration, ¶ 13-33, et seq., and particularly ¶34, where the results of experiments are presented in tabular form. Notably, the statement from Yamuro that, "it is proved

from experience", that the resistance is necessary rings true. None of the circuits that eliminated the resistor worked for a period longer than it took for the LEDs in the light strings to rapidly and successively fail. In addition, the LED art is replete with the teaching that the resistor 8 as set forth in Yamuro is a necessity. (See Mark Allen Declaration, ¶ 5-9, 11-12, and attached Exhibits B-F thereto).

Lastly, the claim recites a formula for determining the number of LEDs to be used in a block series of LEDs for an LED light string to embody the present invention. Specifically, the formula is directed to using the average alternating drive current of the LEDs to be used and dividing this number into the supply voltage, the calculation revealing the total number of LEDs to be series connected in each block. Inasmuch as Yamuro does not concern itself with this issue at all, there is no disclosure of this formula. The Examiner, however, asserts that a person of ordinary skill, when confronted with producing a Yamuro circuit for a given voltage would unavoidably derive this formula from routine design necessity. This assertion by the Examiner is refuted by Yamuro's own language and suggested practice.

In col.7, lines 17-end, the circumstance is described in Yamuro where a 24V power supply is to be used in conjunction with the described LED invention. Notably, even though 2V LEDs are used, Yamuro does not use 12 LEDs as suggested by the Examiner's "unavoidable" consequence theory, instead the Yamuro solution is to specify 10 LEDs to be used in conjunction with a 4V voltage drop resistance 32 also connected into the circuit. (Note the presence of the resistor in conjunction with the LED string!) Hence a solution is derived in Yamuro for exactly the circumstance the Examiner describes, but the solution is entirely different than what is proposed as "unavoidable" by

the Examiner. Yamuro again, in fact, teaches away from what is suggested by the examiner.

In light of the foregoing documentary assertions, and experimental results, that affirm Yamuro's own assertions regarding the inclusion of the resistor as being necessary, the Examiner's contrary assertions, without a supportive teaching in the art, that the resistor is optional is without merit and cannot form a basis for rejection of the claims under 103. Likewise, the further assertion by the Examiner that the formula for calculating the number of LEDs to be connected in a series block by relying on the average AC drive voltage is an "unavoidable step" is also without merit. No teaching of this formula is pointed to, instead the Examiner relies on the mere assertion that it is routine. Such an unsupported assertion cannot form the basis of a 103 rejection.

Second Rejection:

Summary: Claims 4, 6-8, and 21-24 are rejected under 103 over Yamuro in view of Reymond. Starting with the, previously refuted herein, basic rejection that Yamuro discloses the circuit of claim 1, the Examiner adds features from Reymond to meet claim limitations recited in the separately identified claims.

Rebuttal: Inasmuch as the basic Yamuro rejection fails to meet the requirements of a 103 rejection as against claim 1 of the present application, and Reymond is not cited to make up for those deficiencies, but rather to address features recited in further claims, this combination rejection must also fail. [Indeed, as to the fundamental resistor inclusion issue, the Reymond prior art description recites, in col. 2, lines 50-52, that a resistor

"must" be included in a typical state-of-the-art LED based circuit. (See also line 57, id). Hence, another teaching away from the Examiner's position that such a circuit is plausible in the LED art.]

Reymond is cited to disclose the use of 110/120V AC in combination with LED strings. Again, however, an inductor and/or other circuitry (i.e., a capacitor) is required in each of Reymond's LED circuits, and, additionally, Reymond does not teach or suggest the formula for calculating the number of LEDs per string based on their average AC drive current. Instead, Reymond relies on an included inductor circuit to limit current and has an example using 120V AC at 60 Hz and an average current of 24ma using an array of 20 LEDs. (See col. 5, lines 58-65, of Reymond.) No mention whatever is made of applicant's claimed LED number calculation limitation. In addition, no mention is made of the series connected blocks of 100 LEDs in applicant's claims.

The lack of series connected LEDs from the Reymond disclosure is based on the fact that Reymond is directed entirely to strings of coupled parallel-connected LEDs. The lack of the same numbers of LEDs being strung in series is unexplained by the Examiner notwithstanding the rejection having been made.

The Examiner skips past this lack of disclosure in either Yamuro or Reymond by ignoring it. The Examiner then proceeds to a proposed extrapolation of a 50 LED string from Yamuro, i.e., simply double it and you have obvious 100 LED series blocks. How Reymond suggests this is not apparent.

It is not the math that is at issue. The fundamental issue is whether Yamuro and Reymond can even be combined, especially in light of the improper interpretation of Yamuro on which the Examiner has based the rejection. That is, the Examiner states that

to meet the language of the present claim 1, the Yamuro circuit should be resistor less and free from other circuitry as claim 1 recites. However, Reymond is far from being free from other circuitry. Reymond teaches that other circuitry, i.e., besides mere LEDs and wire, is essential to the workings of each circuit in Reymond. In some versions of the Reymond invention an inductor L replaces the resistor necessary in LED circuits using AC (see i.e., Fig. 4) and in other embodiments an inductor is combined with a capacitor (see i.e., Fig. 5). In addition, the Reymond described circuits require that each successive LED in each pair of LEDs be oppositely polarized when used in AC. The reason is that for each cycle of the AC one or the other of the LEDs will light. (See col. 5, lines 1-7 of Reymond.) It is manifestly not clear from the Examiner's assertions how the respective LED circuits of Yamuro and Reymond would combine to meet either the present claim language or what the teaching would be to combine the circuits. For example, how does a hypothetically resistor-less circuit from Yamuro combine with the inductor and optionally capacitor equipped Reymond circuit to become "free from additional circuitry" as recited in claim 1? How do the series connected Yamuro LED circuits combine with parallel-connected LED couplets in Reymond?

In view of the foregoing failure of Reymond to supply the deficiencies of Yamuro vis-à-vis the limitations of claim 1, and the further lack of disclosure in Reymond to set forth the further limitations in claims 4 & 23 (110 V AC), 6 & 21 (220V AC), 7 (continuous perceived light), 8 (50 Hz operation), 22 (100 series connected LEDs), and 24 (50 series connected LEDs) along with any suggestion or teaching of combination, the rejection must fail under 35 USC 103.

Third Rejection:

Summary: Claims 11, 12, 17, and 18 are rejected over Yamuro under 35 USC 103. The claim features, while not suggested or taught in Yamuro, of random color or similar color and order, are obvious as a matter of design choice.

Rebuttal: Inasmuch as the basic Yamuro rejection of claim 1 fails, the rejection of dependent claims, reciting additional features directed to LED color and physical arrangement, must also fail. Yamuro simply doesn't disclose these additional features and the Examiner's rejection does not supply any basis other than design choice. No teaching or suggestion for this design choice is supplied. This is improper under 35 USC 103.

Fourth Rejection:

Summary: Claim 5 is rejected under 35 USC 103 over Yamuro in view of Reymond. The recited limitation of limiting the LED light string voltage to less than the break down voltage of the selected LED p-n junction is considered an obvious expedient inasmuch as if this was not done, excess heat in the diode would be the result and a person of ordinary skill would understand that as undesirable.

Rebuttal: Inasmuch as the person of ordinary skill upon which the Examiner relies doesn't realize that a resistor-less LED circuit connected to AC is unstable and will fail, (See Mark Allen Decl. Experimental results table), how does this person discover that

excess heat in the diode is unacceptable. After all, if absolute failure of the system is somehow okay without a resistor, what is wrong with a little heat on the way to failure? Once again, it is not clear how Yamuro and Reymond combine in a rejection of this claim 5, not only for the reasons and arguments previously set forth, but also because neither reference recites any mention whatever of the p-n junction breakdown voltage of an LED being useful to calculate an upper limit on current for the entire string. The alleged meeting of this additional claim recitation seems to be entirely from the Examiner's understanding of LED circuitry wholly apart from the disclosures of these references. This is not explained and without such an explanation or teaching being provided, a rejection under 103 is not well founded and must fail.

Fifth Rejection:

Summary: Claims 13 and 28 are rejected under 35 USC 103 over Yamuro in view of Frohardt et al. Yamuro discloses the invention of claims 1 and 11, and Frohardt discloses fiber optic bundles for use in conjunction with a light source.

Rebuttal: Inasmuch as Yamuro fails as a basis to reject the claims upon which claims 13 and 28 depend, this rejection of further features must also fail. Frohardt does not supply the basic circuitry deficiencies of Yamuro, but instead discloses the use of fiber optics with a light source.

Sixth Rejection:

Summary: Claims 19, 20, 26 and 27 are rejected under 35 USC 103 over Yamuro in view of Chang. Yamuro is relied on as the basic reference and Chang is relied on for showing a mounting structure for an LED bulb that includes a mechanical feature for orienting the bulb in the socket.

Rebuttal: Yamuro does not disclose or describe the invention in the basic claims from which the additional claims rejected by this rejection depend. This reference to Chang does not make up for this basic deficiency and hence this rejection must also fail. In addition, Chang speaks to aligning an LED bulb having a dint 31. It does not speak to a possible reason or necessity for such an alignment. In contrast, the present claims 19, 20, 26, and 27 recite polarity as the characterizing feature of the LED requiring a specified orientation of the LED. Hence, it is offered that the Examiner is relying on both hindsight and speculation to arrive at the combination of Yamuro and Chang. Neither is permissible under 103 and the resulting rejection must fail.

Rebuttal of all 35 USC 103 Rejections in view of Secondary Considerations:

This application file includes two declarations filed March 21, 2001[2]. The declaration from Mark Allen has been referred to extensively for its experimental and documentary evidence to rebut the various 35 USC 103 based rejections. The second

[2] Applicant has attached hereto copies of Declarations of Mark Allen and David Allen with Exhibits for the Board's convenience.

declaration submitted by David Allen addresses the secondary considerations rebuttal of the same 35 USC 103 based rejections.

The Examiner in determining issues of obviousness must consider secondary considerations under 35 USC 103. MPEP 2144.08(5)(B). Such considerations rebut a prima facie 103 rejection. Assuming for purposes of presenting the David Allen declaration evidence that the Examiner proffered 35 USC 103 rejections comprise a prima facie rejection, the evidence of commercial success, long felt need, and copying rebut the rejections. The Declaration of David Allen shows sales in excess of $1.5 Million within only 2 months following approval by Underwriters Laboratory in March 2000. See D. Allen Decl., ¶ 12.

The immediate and widespread copying of the claimed invention as set forth in paragraphs 14-22 of the David Allen declaration by Excellence Optoelectronics Inc. and other manufacturers following the introduction of the technology in Taiwan by Dr. Allen rebuts the 103 rejections. At least one of the copiers alleged that it was not possible to construct an LED light set without current limiting circuitry. See D. Allen Decl., ¶ 18.

The commercial success of the claimed invention also rebuts the 103 rejections. David Allen's declaration details the successful introduction of the claimed invention and asserts as the basis for the success the elimination of the current limiting circuitry from the LED light strings. See D. Allen Declaration, ¶ 11-13.

Many and varied businesses have sought information regarding the claimed invention owing to the fact that it seems to have accomplished an objective that the state-of-the-art in LED recognizes as impossible, i.e., the elimination of current limiting

circuitry in AC driven LEDs. See D. Allen Declaration, ¶ 4-10. This long felt need and surprising result rebut the 35 USC 103 rejections.

Conclusion

The foregoing arguments detail the failure of the Examiner's 35 USC 103 based rejections to survive scrutiny under the requirements of such rejections. The basic Yamuro reference lacks sufficient disclosure to support the Examiner's assertions and, taken as a whole, the Yamuro reference teaches away from Applicant's claimed invention. The successive combinations of prior art offered by the Examiner do not supply the deficiencies of the Yamuro reference and, in several instances, i.e., Reymond, also teach away from the claimed invention. In addition, Applicant has submitted rebuttal documentary and declarative evidence against the Examiner's assertions that also surmount the 103 based rejections. The Examiner's rejections should be reversed and such a decision by the Board is respectfully sought.

Respectfully submitted,
Liniak, Berenato, Longacre & White

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APPENDIX OF CLAIMS ON APPEAL

1. (Twice Amended) A light string comprising:

a predetermined number of light emitting diodes "LEDs" electrically coupled in series to form at least one series block, each LED having an average alternating current drive voltage, the series block having a first LED and a last LED, the first LED directly coupled intermediate a source end and a terminal end of a first of a pair of wires and the last LED directly coupled intermediate the source end and the terminal end of a second of the pair of wires, the light string being free from additional circuitry intermediate the first LED and the source end of the first pair of wires, between each of the LEDs, and intermediate the last LED and the source end of the second pair of wires, and

a first connector coupled to both the source end of the first of the pair of wires and the source end of the second of the pair of wires which connector facilitates a direct connection between the first LED and a first side of an alternating current electrical power supply, and the last LED and a second side of the alternating current electrical power supply, the supply having a supply voltage, the predetermined number of LEDs substantially calculated by dividing the supply voltage by the average alternating current drive voltage.

2. The light string of claim 1 in which the light string is adapted to accept alternating current electricity without an intervening conversion to direct current electricity.

3. (Amended) The light string of claim 2 further comprising a second pair of wires supporting the LEDs.

4. The light string of claim 1 in which the electrical power supply provides alternating current having an alternating current voltage of at least about 110 volts.

5. The light string of claim 4 in which each LED has a p-n junction defining a breakdown voltage above which voltage applied in reverse bias said p-n junction breaks down, and in which light string alternating current is less than the break down voltage.

6. The light string of claim 5 in which the alternating current voltage is in the range of about 110-220 volts.

7. The light string of claim 1 in which the alternating current has a frequency effective to cause each LED to emit pulsed light which the human eye perceives as continuous.

8. The light string of claim 7 in which the frequency is at least about 50 Hz.

9. (Amended) The light string of claim 1 in which the first connector is polarized, and which light string further comprises a second polarized connector electrically connected to the terminal end of the second of the pair of wires, said second polarized connector being adapted to couple with a first polarized connector of another light string, thereby providing for coupling of multiple light strings in an end-to-end arrangement.

10. (Cancelled)

11. The light string of claim 1 in which each LED has a corresponding light output color and all of the LEDs in each series block is either of the same color or of different colors.

12. The light string of claim 11 in which the LED's in each series block are arranged by color either in a non-random order or a psuedo-random order.

13. The light string of claim 11 in which at least one LED comprises a housing and a fiber-optic bundle removably mounted to the housing operative to diffuse light output of the LED through the fiber-optic bundle.

14. (Amended) The light string of claim 1 in which the LEDs are offset from the wires and arranged relative to a wire axis.

15. The light string of claim 14 in which each LED is arranged parallel to the wires to create a straight arrangement.

16. The light string of claim 14 in which the LEDs in each series block are uniformly spaced apart.

17. The light string of claim 14 in which the LEDs are arranged in offset groupings, each offset grouping having length relative to the LEDs therein, and are arranged perpendicular to the wires to create a light string having a certain arrangement, wherein the light string is comprised of offset groupings which are spaced either uniformly or nonuniformly in either periodic or psuedo-random arrangement.

18. The light string of claim 17, wherein the LEDs are uniformly spaced by a first distance within an offset grouping and each offset grouping is uniformly spaced by a second distance along the drive wire axis.

19. (Amended) The light string of claim 1 further comprising a lamp holder having a keyed offset, the lamp holder fixedly attached to each LED, and

a lamp base having a notch adapted to receive the keyed offset of the lamp holder, thereby mechanically orienting and aligning each LED by its polarity.

20. (Amended) The light string of claim 19 wherein the lamp base further comprises a base keyed offset and a lamp assembly holder, the lamp assembly holder having a notch adapted to receive the base keyed offset.

21. The light string of claim 6, wherein the ac source is 220 VAC.

22. (Amended) The light string of claim 21, wherein the predetermined number of LEDs in the series block is 100.

23. The light string of claim 6, wherein the ac source is 110 VAC.

24. (Amended) The light string of claim 23, wherein the predetermined number of LEDs in the series block is 50.

25. (Amended) The light string of claim 1, wherein the light string further comprises a plurality of series blocks.

26. The light string of claim 9, wherein the first polarized connector is a polarized plug.

27. The light string of claim 26, wherein the second polarized connector is a polarized socket.

28. (Amended) The light string of claim 1 further comprising a lossy fiber optic rod, having a diameter of a corresponding LED lens, and a fiber housing, wherein the fiber housing adaptively receives the rod and LED lens into opposing ends, cooperatively, thereby creating an optical icicle feature.